

CF Industries Final Public Report ESA-039

Introduction:

The CF Industries' Donaldsonville Nitrogen Complex is the largest nitrogen production facility in North America. The facility produces three major fertilizers, Ammonia, Urea (granular or in solution) and Urea Ammonium Nitrate (UAN). To accomplish the production of these fertilizers, the facility uses 13 process units. There are 4 Urea plants, 3 Nitric Acid Plants, 4 Ammonia plants and 2 UAN plants.

Each plant is capable of producing the steam necessary for their process and also some of the plants have interconnected steam lines in case any problems with steam supply arises.

The facility has its own on-site storage capacity, rail car loading stations and ship loading docks fronting the Mississippi River.

Objective of ESA:

The main objective of the ESA was to target a specific area in the facility in which we could find some energy savings opportunities that could be modeled using the SSAT and 3E plus software tools.

Focus of Assessment:

Steam Systems and Personnel Training in DOE Steam System Tools

Approach for ESA:

The Urea 4 plant was targeted to study steam generation and usage based on readily available data and complexity of the system to perform the necessary personnel training in DOE Steam System Tools.

General Observations of Potential Opportunities:

Total gas usage for the facility in 2005 was 63,311,882 MMBTU which includes feedstock and fuel. The fuel portion was 31,592,502 MMBTU. The targeted area (Urea 4 plant) had a fuel consumption of 2,192,669.

The utility costs used for the assessment were \$7.50/MMBTU for fuel, \$2.50/Kgal for water and \$0.055/kWh for electricity. These numbers were selected for purposes of the model and calculations only; they are estimates that may not represent actual contract prices available to the site.

After the assessment, the following opportunities were identified:

a) Near Term Opportunities

- Change Blowdown Rate
The project involves the reduction of the blowdown rate from the existing 2% to a proposed 1.5%. Based on preliminary calculations, after the implementation of the project the Urea 4 plant will reduce fuel consumption by 0.1%.
- Change Boiler Efficiency – O₂% Reduction
The project involves the reduction of O₂% levels from 2.5% to 2%. The reduction is feasible due to the existing controls. Based on preliminary calculations, after the implementation of the project the Urea 4 plant will reduce fuel consumption by 0.1%. Further study is necessary to estimate how the project will affect their stack emissions; based on preliminary combustion reports it does not seem it would be a problem.
- Shut off steam line from Urea 2 plant to Urea 4 plant
Currently there is a long run of 6" line that is maintained hot in case there is a need for back up steam to go from one plant to the other. The steam supply to this line could be shut off, based on the fact that is not being used and will only be used in case of one of the boilers is down and they need to get the steam from the other plant. Based on preliminary calculations, after the implementation of the project the Urea 4 plant will reduce fuel consumption by 0.1%.

b) Medium Term Opportunities

- Change Condensate Recovery Rates
This project involves increasing condensate return 5%. A higher increase will not be possible since there is a lot of steam injected into process that could not be returned. Based on preliminary calculations, after the implementation of the project the Urea 4 plant will reduce fuel consumption by 0.4%.

- Modify Feedwater Heat Recovery Exchanger using Boiler Blowdown

This project involves the installation of a Heat Exchanger to preheat makeup water using the sensible heat from the blowdown. Currently the plant has flash heat recovery from the boiler blowdown. Based on preliminary calculations, after the implementation of the project the Urea 4 plant will reduce fuel consumption by 0.2%. This percentage takes in consideration that reduction on blowdown rate is already applied.

c) Long Term Opportunities

- PRV replacement with Steam Turbine

Currently the plant uses a PRV to reduce the pressure from 330psig to 290psig before it goes to the users. Since there is a large flow going thru the PRV, the installation of a turbine was considered. Based on preliminary calculations, after the implementation of the project the Urea 4 plant will reduce electric consumption by 3.7% and increase boiler duty by 1%.

Management Support and Comments:

Plant personnel was open to new ideas and all requested information was provided right away which indicated an excellent level of system monitoring and measuring.

Energy management department staff is very knowledgeable and aware of possible energy savings opportunities that could take place.

A good energy management program is currently in place and includes the participation of all key operational personnel along with the engineering department.

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